RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
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To: **Licensed ISDS Designers, Approved Installers and Other Interested Parties**
Date: **April 30, 2004**
Subject: **Advisory Concerning BSF Design and Installation Procedures – Cold Weather Related Design Adjustments and Precautions**

Approximately thirty (30) instances of malfunctions of bottomless sand filter systems due to cold weather freeze-ups have been reported to the Department during the past winter months. The reports followed periods when outdoor nighttime temperatures fell below 10 degrees Fahrenheit for several consecutive days. Problems were varied but included frozen transport pipes, frozen laterals, and possibly frozen filter media due to poorly sorted stone containing fines. The majority of cold weather malfunctions reported involved BSFs preceded by a BioMicrobic FAST pre-treatment system. The Department and the vendor are currently collecting data and investigating the basis of this occurrence. Overall, the number of BSFs reporting freeze-up problems represents less than 5% of all installed BSFs.

The following are changes to selected portions of the BSF Guidance Document that are intended to help reduce incidence of problems related to cold weather operation. Also included are recommendations concerning design, installation and maintenance procedures that will help avoid these types of problems. Maintenance providers are urged to consider retrofitting those BSFs which they maintain that appear susceptible to cold weather malfunctions.

Selected paragraphs of the BSF Guidance Document are revised as follows:

4.6(b) Orifices –

A series of 1/8 inch diameter holes (orifices) shall be drilled in the distribution laterals and spaced no less than 14 inches and no more than 24 inches apart. **Two (2) orifices in each lateral shall be drilled pointing up (12 o'clock position); all other orifices shall be drilled pointing down (6 o'clock position). The up-pointing orifices shall be located approximately 1/3 and 2/3, respectively, along the length of each lateral. Orifice shields shall be placed over each orifice (above or below the lateral, as required).** Orifice shields placed below any orifice shall contain slots or holes to provide free draining (usually referred to as cold weather orifice shields). See Figure 8.

All BSFs covered by this document shall be dosed up to a maximum of 0.25 gallons per orifice per dose. Pump manufacturers will usually help provide pump calculations to assist with this design requirement.

5.1 Installation of Sand Filter Media

(f) After the required amount of filter sand has been added to the filter, place (3) inches of 3/8" washed pea stone over the filter sand. After the distribution laterals and orifice shields have been assembled atop the pea stone, **add more pea stone so that a three (3) inch depth of pea stone is installed over the laterals and any upper orifice shield (See Figure 8A). The total depth of pea stone over the sand media will range from eight (8) to nine (9) inches, depending on the size of lateral pipe employed.** No filter fabric of any kind should be placed between the sand and overlying pea stone.

Design, Installation and Maintenance Recommendations:

Location of BSF: Recent Inspections have shown, that a BSF partially in the afternoon sun and partially in the shade was frozen only in the section that did not receive direct sunlight. Precautions should be taken by the designer to ensure, if possible, that the BSF be located to receive the maximum direct sunlight.

Transport lines: The manual currently describes that these must be sloped to allow drain back and prevent freezing yet designs are often such that only minimal slope is provided. Problems with transport lines may be diminished by providing greater pitch and by keeping the pump chamber close to the BSF whenever possible. In the installation of transport lines greater care must be taken to prevent sagging after backfill due to settling. If necessary less flexible piping should be specified on longer runs. Ensure that transport lines are placed on undisturbed trench bottom

Check valves, anti-siphon devices and traps in the lines prevent the proper draining of lines. If such a device is required care must be taken so that the lines will drain positively. Shallow transport lines shall not remained charged with effluent at any time.

Quality of Sand Media: Consistency of product quality is the main issue. Providers of product must be able to ensure that the media specifications in the BSF document are met. Often the ASTM C-33 spec is quoted but remember there are other qualifiers in the document which must be met.

- (D10) = 0.3mm.
- U.C. = 3.0 to 4.0
- % Fines passing a 200 sieve shall be < 1%

This last requirement is often over looked.

Quality of Peastone: A 3/8" round or sub rounded, non-shale or other soft stone, screened or crushed, double washed, containing little or no fines and uniform in size so that no more than 5% shall pass the 3/8" sieve is the required standard for all applications.

Start-up precautions: Systems should not be started up during the coldest months of the year as it may lead to water sitting with no biological activity for a long period of time allowing the water to freeze within the system or cool excessively causing rapid freezing at the BSF. Systems in high water situations should only have the proper amount of water to prevent buoyancy if required. If at all possible avoid mid winter start ups.

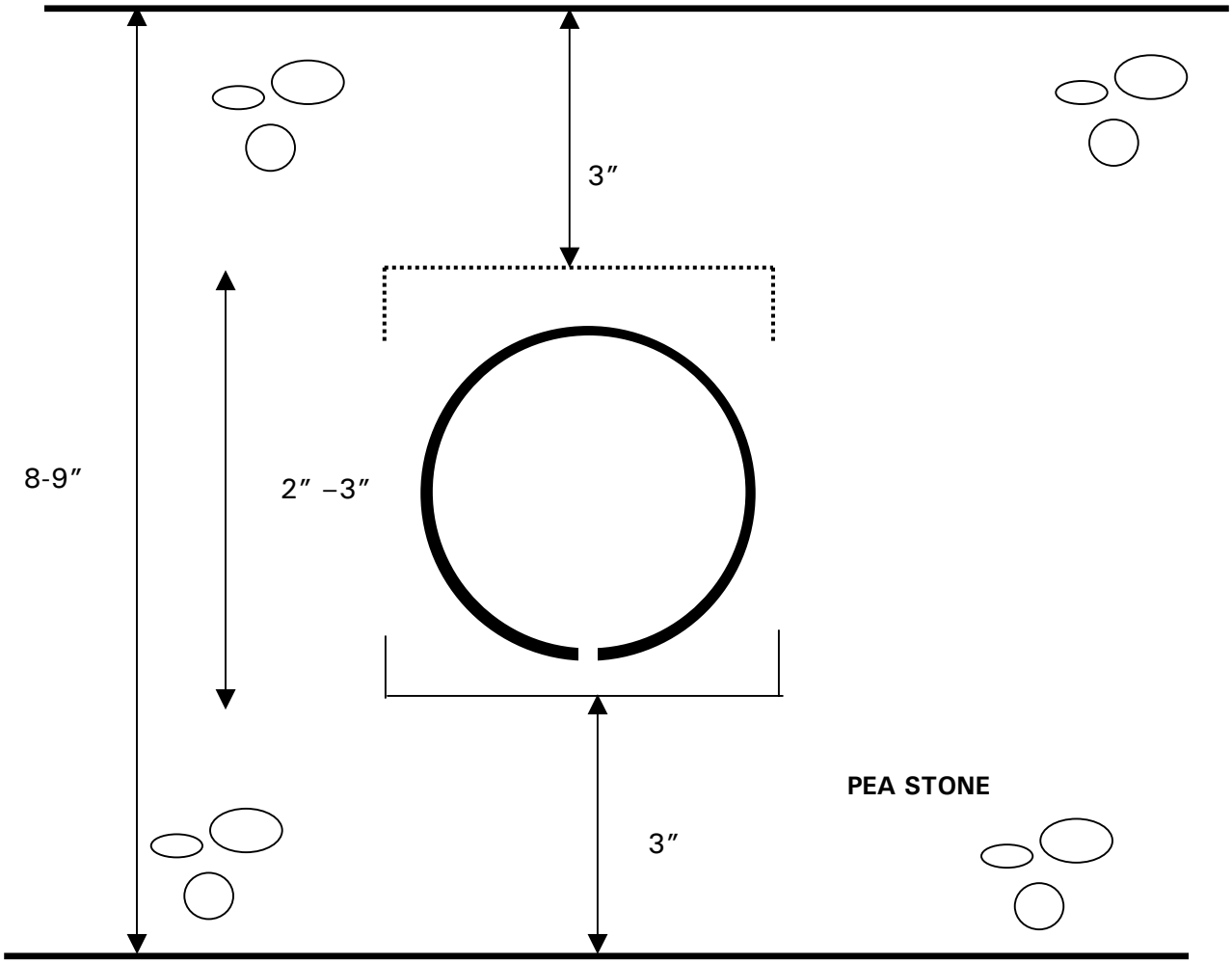
Maintenance: High risk systems should be identified as they may require extra care during extreme cold conditions. All systems should be bottled brushed and laterals thoroughly cleaned prior to the winter. All Designers should provide adequate notes on their plans to ensure proper maintenance.

Retrofit:

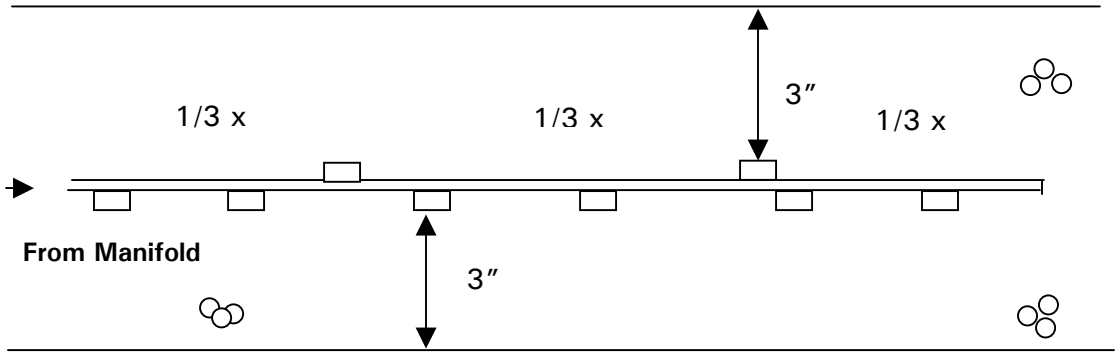
Maintenance providers are encouraged to retrofit existing BSFs showing evidence of cold weather malfunctions. Retrofits may include drilling of upfacing orifices, addition of orifice shield, or placement of additional pea stone to achieve the required three (3) inch depth over the laterals may be made. Please note that any upfacing orifice drilled may require plugging of a downward facing orifice, in order to maintain proper pressures during dosing. A short, thick screw that does not penetrate the interior of the lateral may be used to plug these orifices. Transport lines that were installed improperly should be adjusted to prevent freezing. No RIDEM permit is required to make these maintenance adjustments. However, it is recommended that maintenance providers review any extensive retrofitting needs with the original designer and/or installer to ensure consistency with the original design.

DEM gratefully acknowledges the Innovative & Alternative Technology Technical Review Committee and various individual, including George Loomis, Rick Pezza, Tim Stasunias, Bob Johnson, Dave Cotton for their technical expertise and assistance in providing suggestions and modifications to BSFs design and installation specifications and procedures. Please address questions or comments concerning this advisory to Peter O' Rourke @ 401-222-4700 ext. 7714

Attachment- Figure 8A.



TRANVERSE SECTION VIEW.



LATERAL SECTION VIEW.

FIGURE 8A — ORIFICE SHIELD & LATERAL DETAILS